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Before the

Federal Communications Commission

Washington, D. C. 20554

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

In the Matter of:	)	
An Inquiry into the Commission's Policies and Rules Regarding AM Radio Service Directional Antenna Performance Verification	)	**MM Docket No. 93-177**

REPLY COMMENTS OF MULLANEY ENGINEERING, INC.

Mullaney Engineering, Inc., a broadcast consulting firm with over 40 years of experience in AM broadcasting, hereby submits reply comments to the Notice of Proposed Rulemaking regarding AM Directional Antenna Performance Verification.

While we sympathize with the basic concept of the docket that something needs to be done to relieve the technical burdens associated with the operation of AM directional antenna arrays, we caution the Commission not to eliminate all forms of external verification. Over the past five to ten years we have noticed a marked increase in the number of directional AM stations that are significantly out of adjustment. While certainly the deterioration in the technical quality of AM station operation is directly tied to its aging infrastructure, we believe that it is also directly tied to the deregulation and the near total elimination of station inspections by the FCC. Many years ago, when broadcasting was just developing as an industry, the operator of a station was quite often the owner of the station and, therefore, there was a direct connection to the owner's

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livelihood. However, now that broadcast stations (or more appropriately called "broadcast properties") are selling for millions of dollars, the ownership of stations is more of an investment than a livelihood. Consequently, the "bottom line", and not compliance with FCC rules, is the driving factor.

The NPRM seeks comments on the useability or applicability of using "method of moments" computer models in the design and implementation of AM broadcast arrays. Our office has had several versions of the NEC computer program (Numerical Electromagnetic Code) available on our in-house computer system for several years. Over this time period, we have found the answers provided by NEC to be less than reliable. Some times it was due to GIGO (garbage in - garbage out) or in other words mistakes on our part in the modeling of the tower and antenna system. However, other times, we could find no reason for the incorrect answer. We do not want to imply that we never got a correct answer from NEC because this would be untrue. In certain instances, we have found NEC to be a very accurate predictor especially of drive point impedances. However, in other cases, the answers provided by NEC were significantly different from results obtained from other accepted methods. The biggest problem is that it is sometimes difficult, if not impossible, to determine whether NEC is telling the truth or essentially whether the question was correctly described to NEC.

The 1980's saw the Personal Computer (PC) evolve from a very expensive and very limited computer platform into a very affordable and very sophisticated tool. As would be expected, broadcasters and consultants are taking great advantage of this new technology. However, we are afraid that a very complex tool, such as NEC, will be used to justify incorrect answers through an inaccurate description of the broadcast array. While we believe the majority of such inaccuracies would be attributable to "honest" mistakes, we are all very aware that over the past 10 years there has been an ever increasing occurrence of outright

fraud or total incompetence. **Remember, the fact that a computer provided the answer, doesn't make it correct.**

The computer program NEC has evolved over the years into NEC2, NEC3 and most recently into NEC4 (however, NEC4 is only available to contractors providing services to the government). In addition, NEC was re-written into MINI-NEC for easier use on PCs. As with any very sophisticated item, each revision of NEC has not only corrected previous problems with the computer program, but in so doing it has potentially introduced new errors into that computer program as well. As with anything in life, the only true teacher is experience. Unfortunately, we see no easy way for the FCC to determine who in the industry, or for that matter who in the FCC has sufficient experience to use NEC correctly in all cases. Absent some qualifying criteria (an unlikely event), we believe the wide-spread acceptance of NEC in lieu of real world measurements would be a vast mistake.

Some say that the FCC is not interested in the "real world" but simply a set of regulations that is administratively convenient to implement. They say that this change became clearly evident in the 1970's when the position for the engineering assistant assigned to each commissioner was eliminated (giving credence to the old addage - "don't confuse me with facts, my mind is already made-up"). They also point to the fact that once an FM directional antenna is installed, the station it is <u>not</u> required to (1) prove that the antenna pattern is properly operating at the time it is initially constructed or (2) prove on a periodic basis that the pattern has not changed due to an electrical or mechanical deviation in the antenna system. In addition, they point to the fact that non-directional FM antennas are permitted to look for a mounting position that will maximize the natural distortion caused by their supporting structure (quite often resulting in a power level double that permitted by the rules). Consequently, they believe that the rules governing AM stations should be similarly amended to permit them to make similar

inaccurate assumptions rather than be required to attempt to prove the proper operation of its directional AM array. We do not believe that this is the direction that AM should take.

The elimination of field intensity measurements for AM stations will make it virtually impossible to determine the effects of the environment on the AM station's radiation pattern. Unlike higher frequencies (such as FM & TV), AM stations can be effected by re-radiating objects which are several miles away (this is due to the longer wave lengths associated with lower frequencies used by AM stations). While some modeling can be done with NEC, the biggest problem is the identification of which objects need to be included in the modeling (tall buildings, water tanks, power lines, and other towers). The failure to include a potential re-radiating structure in an analysis will make the pattern prediction inaccurate.

While the AM broadcaster believes that it is currently over regulated, that is far from the actual reality. At the present time, AM arrays are not required to provide any documentation that their towers are properly spaced or on the proper azimuths from each other, or are even the proper electrical heights. Nor are they require to provide any documentation that they have an accurate sampling or monitoring system. Even the lack of proper guy break-up, especially in multi-tower AM directional arrays, can lead to pattern distortion or low pattern RMS. AM arrays that operate in a non-directional mode during the day and then switch to a directional mode at night need to insure that during daytime hours the non-driven towers are not a source of local re-radiation. The proof of all of these items is indirectly provided in the detailed field intensity measurements AM stations are required to take. Many would say that these are hard items to get wrong. While we would like to agree, experience over the years has proven that many of these items are not correct when the station is initially constructed and it was through measurements that the problems were detected. We have visited

many an AM facility that has one or more of its towers on an incorrect bearing and/or spacing. While the majority of these items can be attributed to simple mistakes or stupidity, some are intentional. Before the Commission consider's any further deregulation in the technical operation of AM or any other station, we believe it should specifically address how it plans to detect mistakes or outright falsification. At the present time, the Commission is aware of outright falsification in the construction of some AM facilities and yet no action has been taken presumably due to political presures.

If some form of NEC analysis is permitted, we believe it should be significantly limited in the beginning (no more than three towers). Given the economic realities facing AM broadcasters, does it seem reasonable to continue to grant AM directional designs using five, six and even more towers? Multiple towers simply permit the "shoehorning" of new or modified stations into an already congested & deteriorating AM band. If AM is really in that bad of shape, then the construction of a complex facility requiring continuing on-going maintenance makes little sense. The rules governing the expanded band recognized this reality and as a result will permit only very simple AM facilities (one and in limited cases two towers).

In closing, we wish to state that NEC can and should be used as a very valuable design tool. However, it nor should any computer program be used as a verification tool.

Respectfully submitted,

John J. Mullaney

February 18, 1994.